UC CE

University of California
Agriculture and Natural Resources

Making a Difference for California

Fruit & Nut Tree Pruning for Arborists

June 28, 2012

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Some slides provided by Larry Costello, Paul Vossen and Joe Connell

Topics to Be Covered

- Landscape vs. Fruit Tree Pruning
- Landscape Tree Training – Refresher
- Establishing Fruit & Nut Trees
- Fruit & Nut Tree Training
- What to Do About Overgrown Trees
- Pruning Citrus
- Pest Management for Fruit Trees

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Reasons for Training Young Landscape Trees

- Improve structural strength
- Reduce maintenance
- Increase tree longevity

These also apply to fruit trees

Reasons for Training Young Fruit Trees

- Create light penetration in lower tree
- Support crop load
- Create access for ladder work, fruit thinning, harvesting, etc.

Landscape vs. Fruit & Nut Trees
Differences

Landscape Trees

- Taller trees
- Central leader training
- First branch higher
- Mostly winter pruning
- Few if any heading cuts
- No topping
- Branch spreaders rarely used

Fruit & Nut Trees

- Shorter trees
- Many training methods
- First branch lower
- Summer, winter pruning
- Some heading cuts
- Topping common
- Branch spreaders common

Landscape vs. Fruit & Nut Trees
Similarities

- Branches carry heavy load
  - »Branch length vs. fruit load
- No narrow crotch angles
- Proper pruning cuts for wound closure
- May require support
  - »Cabling vs. rope or stake

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Young Tree Training
The 5 Steps

- Remove broken, dead, diseased, or damaged branches
- Select and establish a central leader

Establish a Strong Leader

Establish a Strong Leader

Avoid Co-Dominant Leaders

Central Leader is Top Dog

Young Tree Training
The 5 Steps

- Remove broken, dead, diseased, or damaged branches
- Select and establish a central leader
- Select and establish the lowest permanent branch (LPB)

Young Tree Training
The 5 Steps

- Remove broken, dead, diseased, or damaged branches
- Select and establish a central leader
- Select and establish the lowest permanent branch (LPB)
- Select and establish scaffold branches

Select and Establish Scaffold Branches

Bradford Pear at FOHC

Young Tree Training
The 5 Steps

1. Remove broken, dead, diseased, or damaged branches
2. Select and establish a central leader
3. Select and establish the lowest permanent branch (LPB)
4. Select and establish scaffold branches
5. Select temporary branches below LPB

Select Temporary Branches

Bur Oak at FOHC

Lowest permanent branch

Temporary branches

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Undercutting the Trees

Planting a Bare Root Tree

Dig hole to fit roots

Lightly tamp soil

Emitters 1 ft. away

Planting a Containerized Tree

Water in

Don't cover soil in pot

Pull out wound roots

Post-Planting Care

- Head tree at 18-36 in. (bare root only)
- Cut back well-placed laterals to 3-8 in., remove all others
- Paint trunk white
  - Interior latex paint & water, 50:50
  - Entire trunk & 2 in. below soil
  - Prevents sunburn & borers

Pruning a Bare-Root Tree

Branches thinner than 3/16

Branches thicker than 3/16

New Shoots on Branches of Newly Planted Tree

Paint Trunks White

(Hot Climates, Afternoon Sun on Trunk)

The Beautiful New Orchard!

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Fruit & Nut Pruning Facts

- Pruning both dwarfs and invigorates trees
- Not pruning moves production to the top and sides of the tree canopy
- Not pruning increases total yield but reduces fruit and nut size
- Fruit trees should be pruned every year, but it is not necessary to prune mature nut trees every year

Reasons for Pruning Mature Fruit Trees

- Maintain vigor and fruitfulness of spurs and increase fruit or nut size
- Reduce alternate bearing
- Stimulate production of new fruit wood
- Remove weak, dead and interfering branches

Fruit Tree Terms

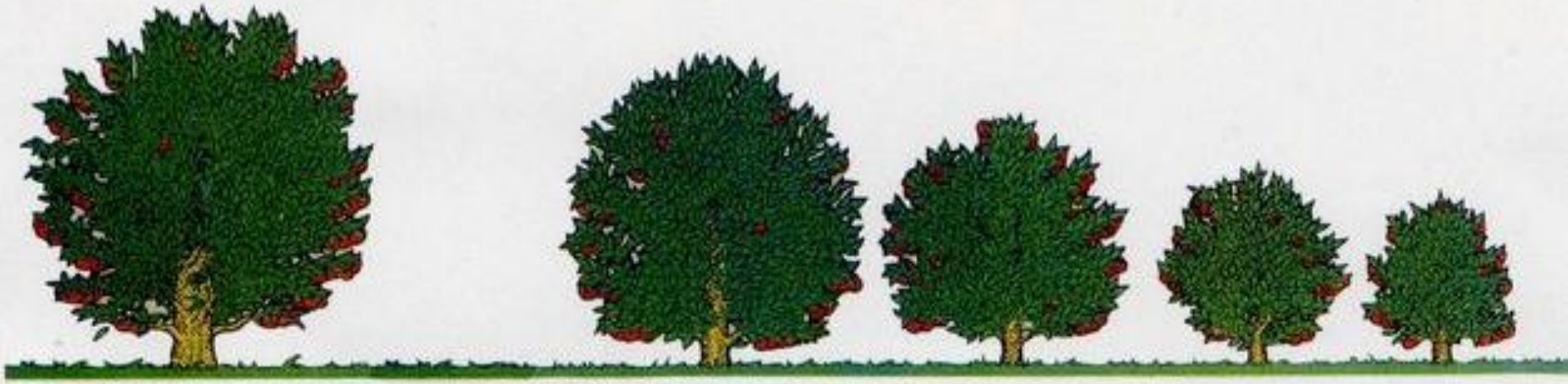
- Rootstock/Stock – tree below graft union
- Scion – above union; bud or shoot grafted
- Crown: trunk below ground (also canopy)
- Tree size
  - Standard – 20-25 ft.
  - Semi-dwarf (dwarfing rootstk) - 12-20 ft.
  - Genetic dwarf (std. rootstock) - 8-12 ft.
    - Peaches, nectarines, apple, citrus

STANDARD OR SEEDLING ROOT

SEMI-STANDARD ROOT

SEMI-DWARF ROOT

DWARF ROOTS



PERCENT OF STANDARD-SEEDLING TREE:

100%	60- 85% RANGE	50% RANGE	30-40% RANGE

APPROXIMATE TREE HEIGHT: WHEN FULL GROWN:

20-25 FEET.	12-15 FEET	10-12 FEET	6-10 FEET

APPLES ROOTSTOCKS:

SEEDLING (NOT OFFERED)	B 118, M 111 & M 106	M 7, GENEVA™ 30	M 26	M 9 & B 9

PEAR ROOTSTOCKS:

SEEDLING	OHxF 97 & OHxF 87	PYRO-DWARF®

CHERRY ROOTSTOCKS:

MAZZARD	MAHALEB, MxM® 60, GISELA® 6	GISELA® 5

Genetic Dwarf Peach/Nect.

INTERNODE LENGTH

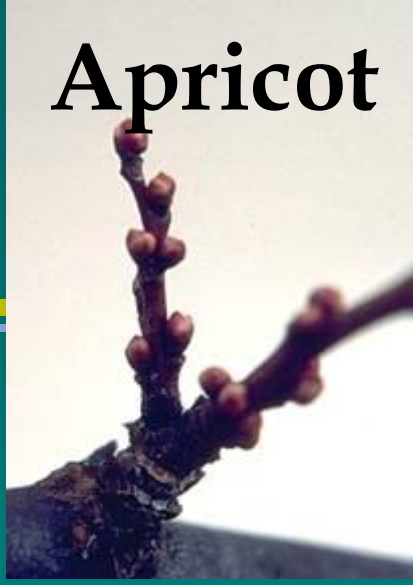
Standard Peach

Genetic Dwarf Peach

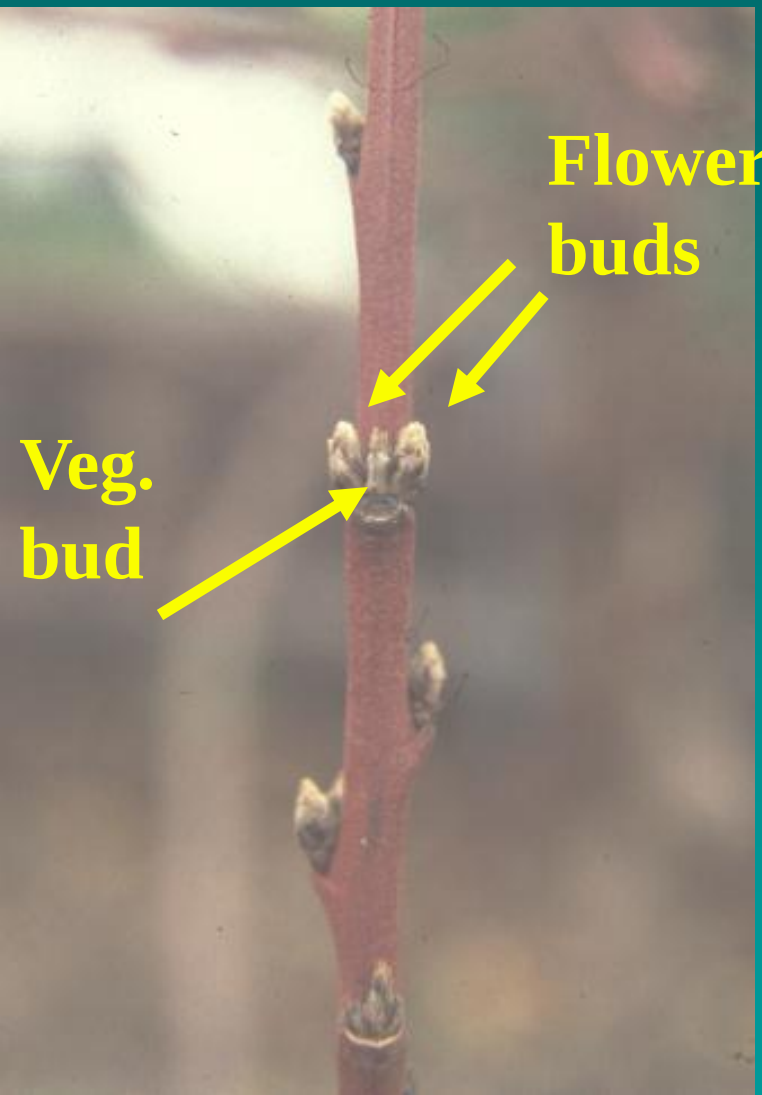
More Fruit Tree Terms

- Scaffold branch: main structural limb
- Spur: short fruiting twig
- Shoot: current season elongated growth
- Water sprout: vigorous shoot from branch
- Sucker: shoot from rootstock or roots

Spurs



Peach Fruiting Branches



Heading Cut

- Removal of part of branch or shoot
- Used to promote branch development, especially on young trees
- Stimulates growth just below cuts
- Can reduce sunlight penetration

Thinning Cut

- Removal of entire branch or shoot, or back to a branch >1/3 the thickness of cut branch
- Used to prevent crowding and improve sunlight penetration
- Defines main branches

Time of Pruning Affects the Response to Pruning

- Dormant → invigorating
- Spring, summer→ dwarfing

Summer Pruning of Young Trees

- Purpose: promote scaffold branches
- Head unwanted shoots to 4-6 in.
- Pinch 2 ft. long scaffold branches to promote side branching
- Reduces training time, shortens time to first fruit production

Summer Pruning for Training
(Open Center)

Before

After

Summer Pruning of Mature Trees

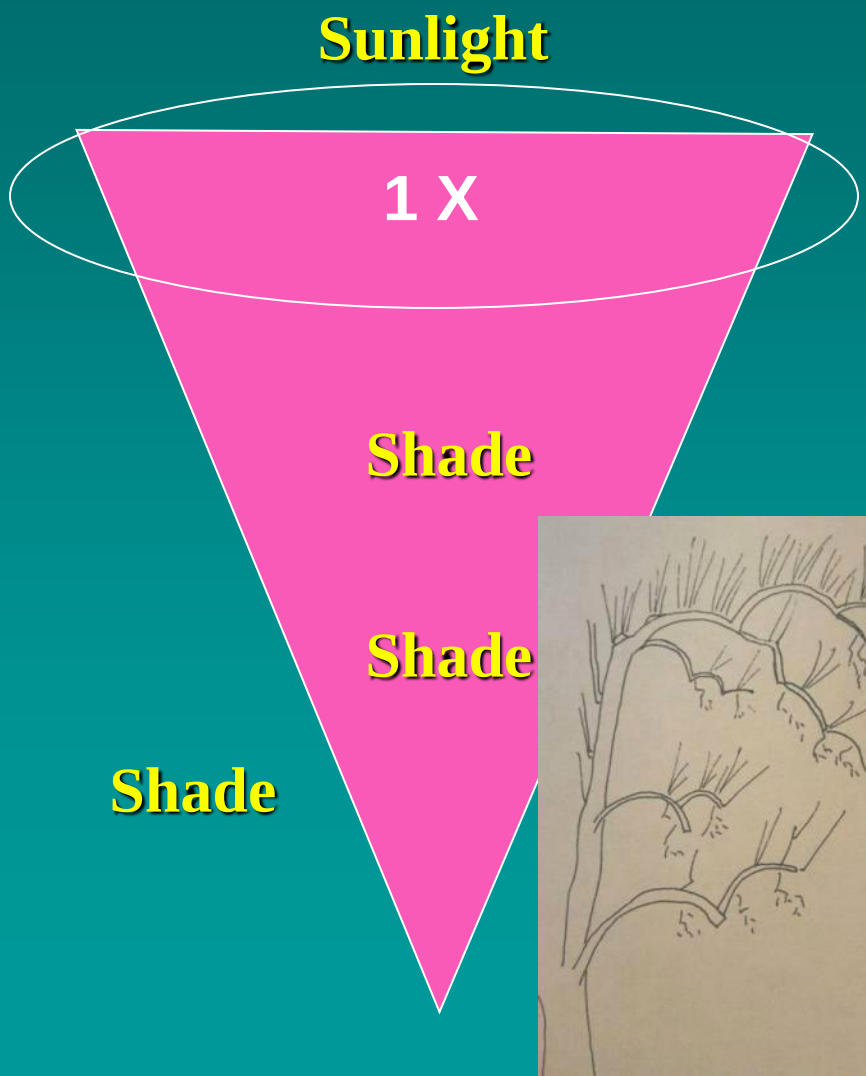
- Purpose: To increase sunlight & productivity of lower fruiting wood
- Remove unwanted vigorous, upright shoots 1-2 times during season
- Bring down tree height
- Large branches may sunburn if pruning is excessive

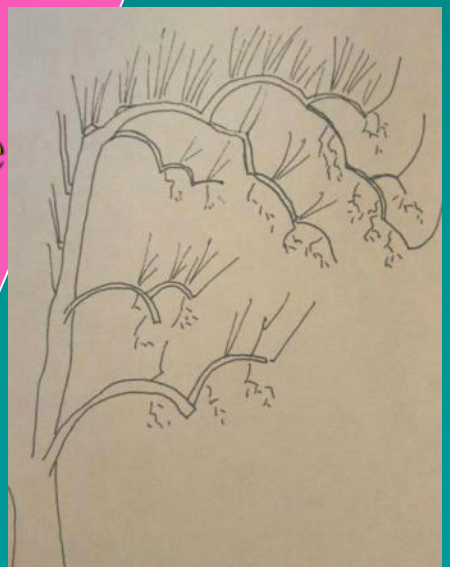
Summer Pruning (Plum)

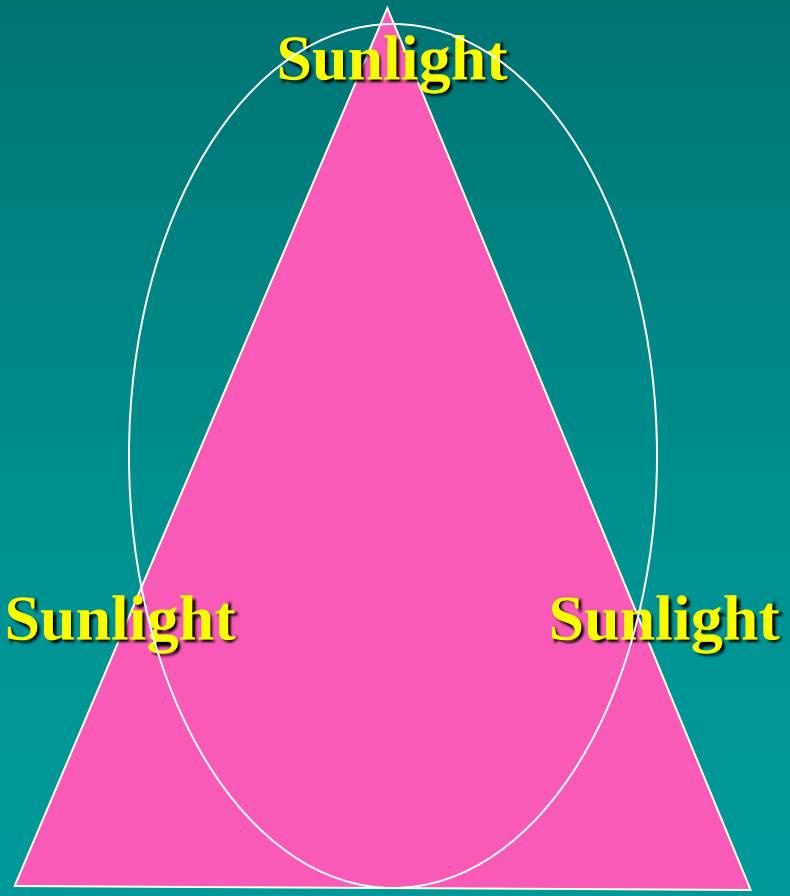
Before

After

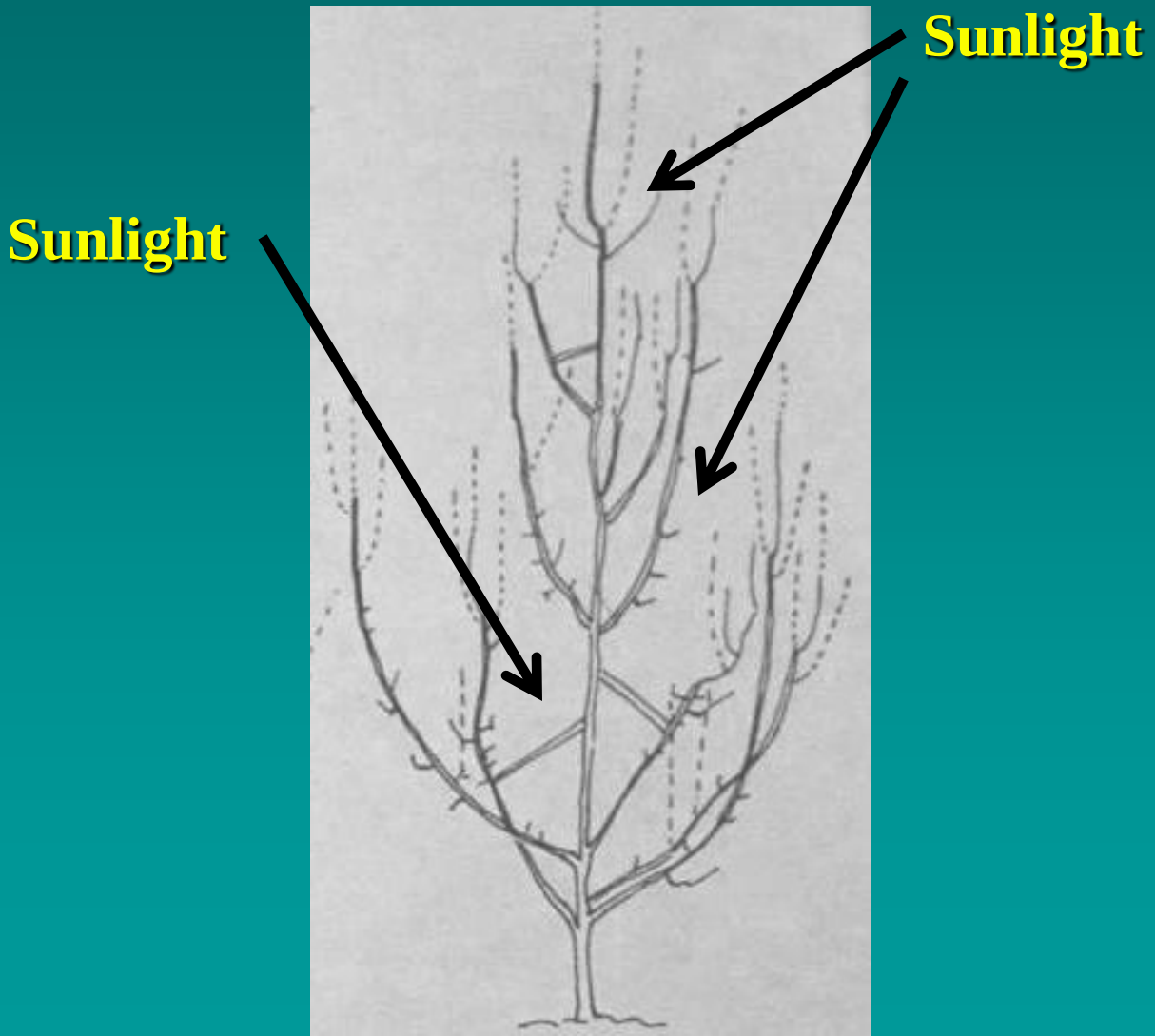
Tree Shape Determines Light Interception



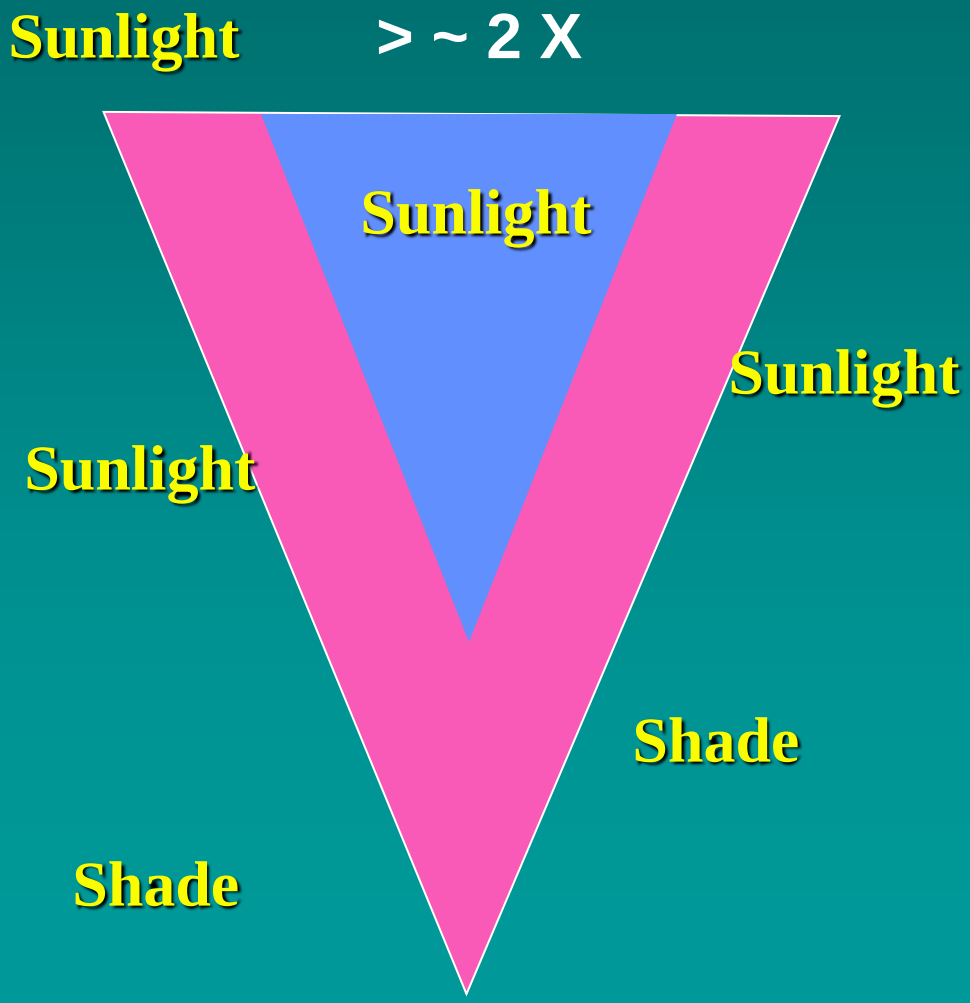




Improving Light Management



Improving Light Management



- More fruit color
- Strong buds
- Strong flowers
- Larger fruit

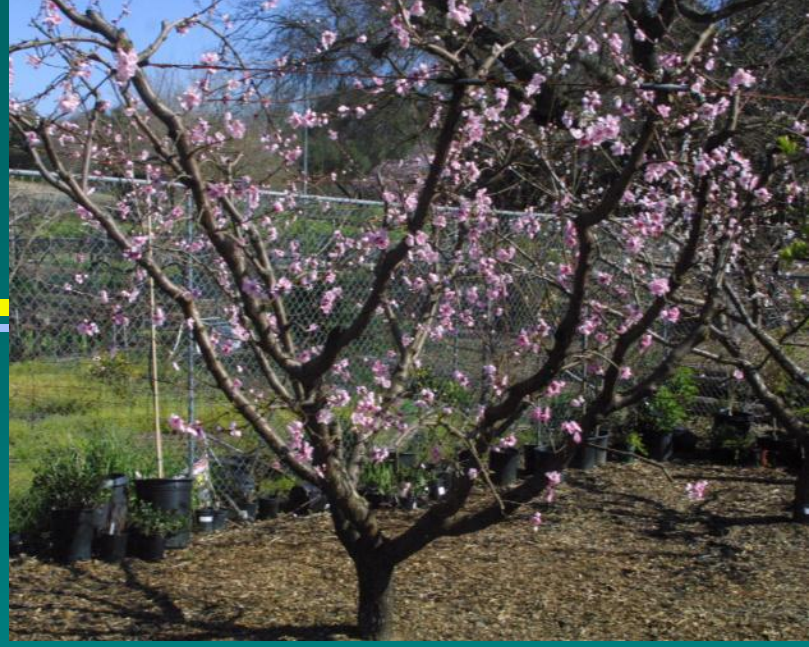
Prune Apricots and Cherries in August to Avoid Branch Diseases

Eutypa dieback (*Eutypa lata*)
Bot canker (*Botryosphaeria dothida*)
Bacterial blast / canker (*Pseudomonas syringae*)

Specific Fruit & Nut Tree Training Methods

- **Open center**
- Central leader
- Modified central leader
- Perpendicular “V”
- Fruit bush
- Espalier

Open Center



- Most common method
- Stone fruits and almonds; can also use for apples, pears, figs, persimmons
- Select scaffolds during first 2 growing seasons, touch up in dormant season
- Keep center open during summer from the start

Open Center

Stake branches outward if necessary (cherry)

Radial separation of scaffold branches (apricot)

Open Center

Differences in branch strength between species

Plum

Persimmon

Specific Fruit & Nut Tree Training Methods

- **Open center**

  Pruning stone fruits

  - **Peach/Nectarine**

Pruning a One-Year-Old Peach

Pruning a Two-Year-Old Peach

Pruning a Mature Peach

Tying Open Center Peach Tree

Removing Old Fruiting Wood

Cut back 2-year-old branches to healthy 1-year-old branches

Almond Training

First Dormant Season After Planting

Almond Training

Second Dormant Season

Before

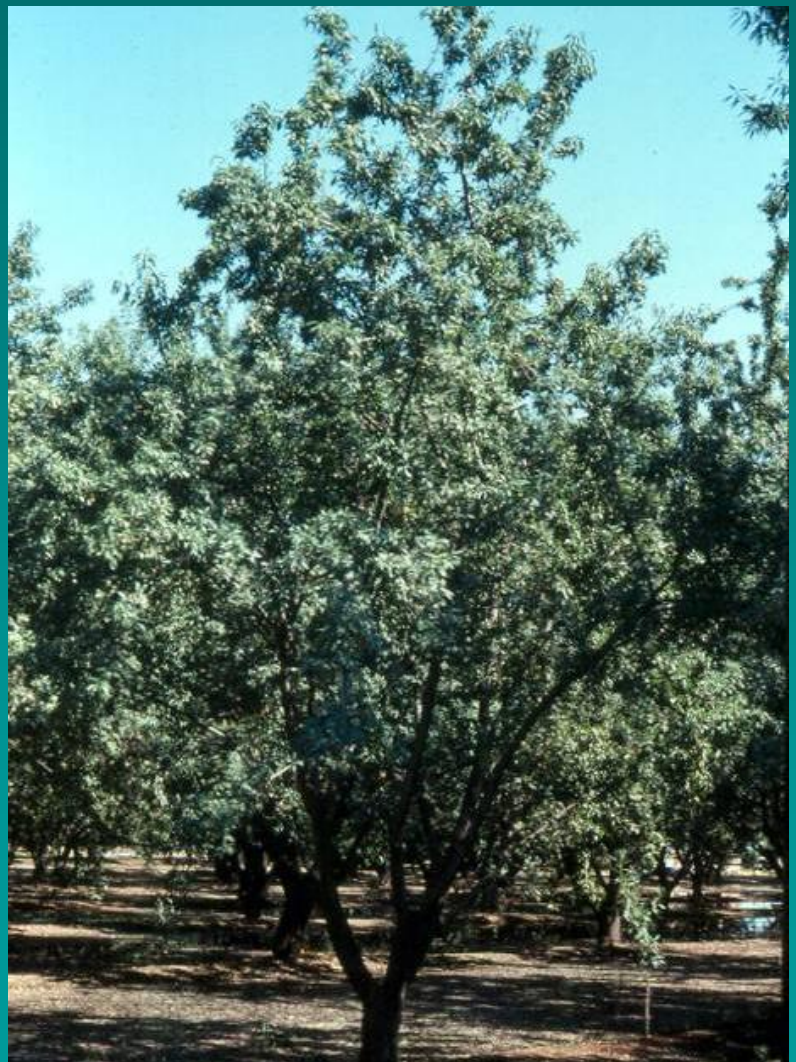
After

Almond Training

Third Dormant Season

Almond Training

Mature Trees



Prune to control tree size, generate new growth, and fill available space

Thin by undercutting the oldest wood and saving new sprouts

Specific Fruit & Nut Tree Training Methods

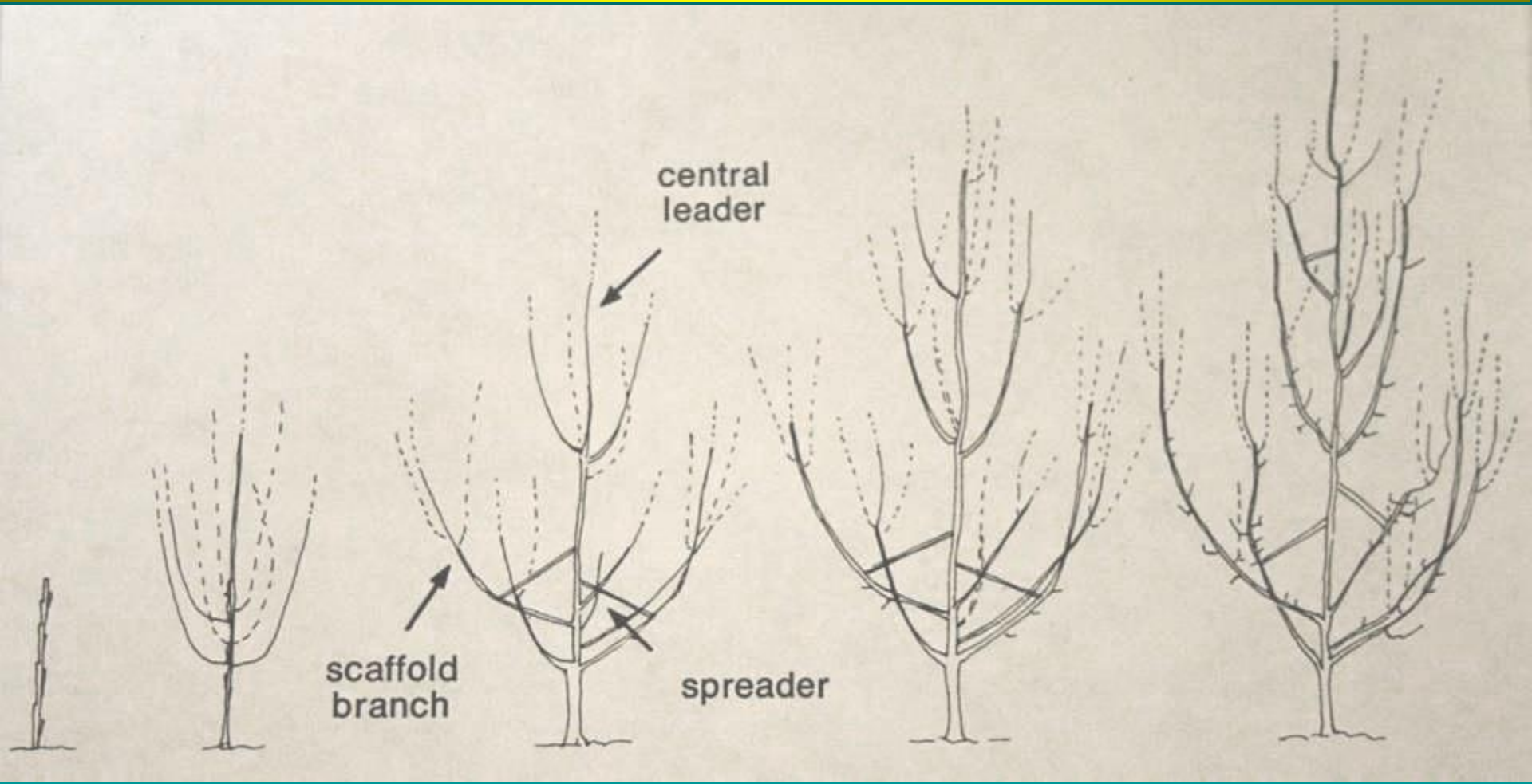
- Open center
- **Central leader**
- Modified central leader
- Perpendicular “V”
- Fruit bush
- Espalier

Central Leader Apple

Central Leader Training

- Used for apples, pears, Asian pears, persimmons, pecans
- Maintain leader, remove at certain height
- Tie or stake lateral branches outward
- Create 3-4 tiers of branches
- Branches offset from those below

Central Leader Training



Spread branches, keep leader dominant

Specific Fruit & Nut Tree Training Methods

- Open center
- Central leader
- **Modified central leader**
- Perpendicular “V”
- Fruit bush
- Espalier

Modified Central Leader

- Persimmons, walnuts; can also use for apples, pears, pecans, and figs
- Start tree as central leader, then cut out the leader part way up

Specific Fruit & Nut Tree Training Methods

- **Modified Central Leader**

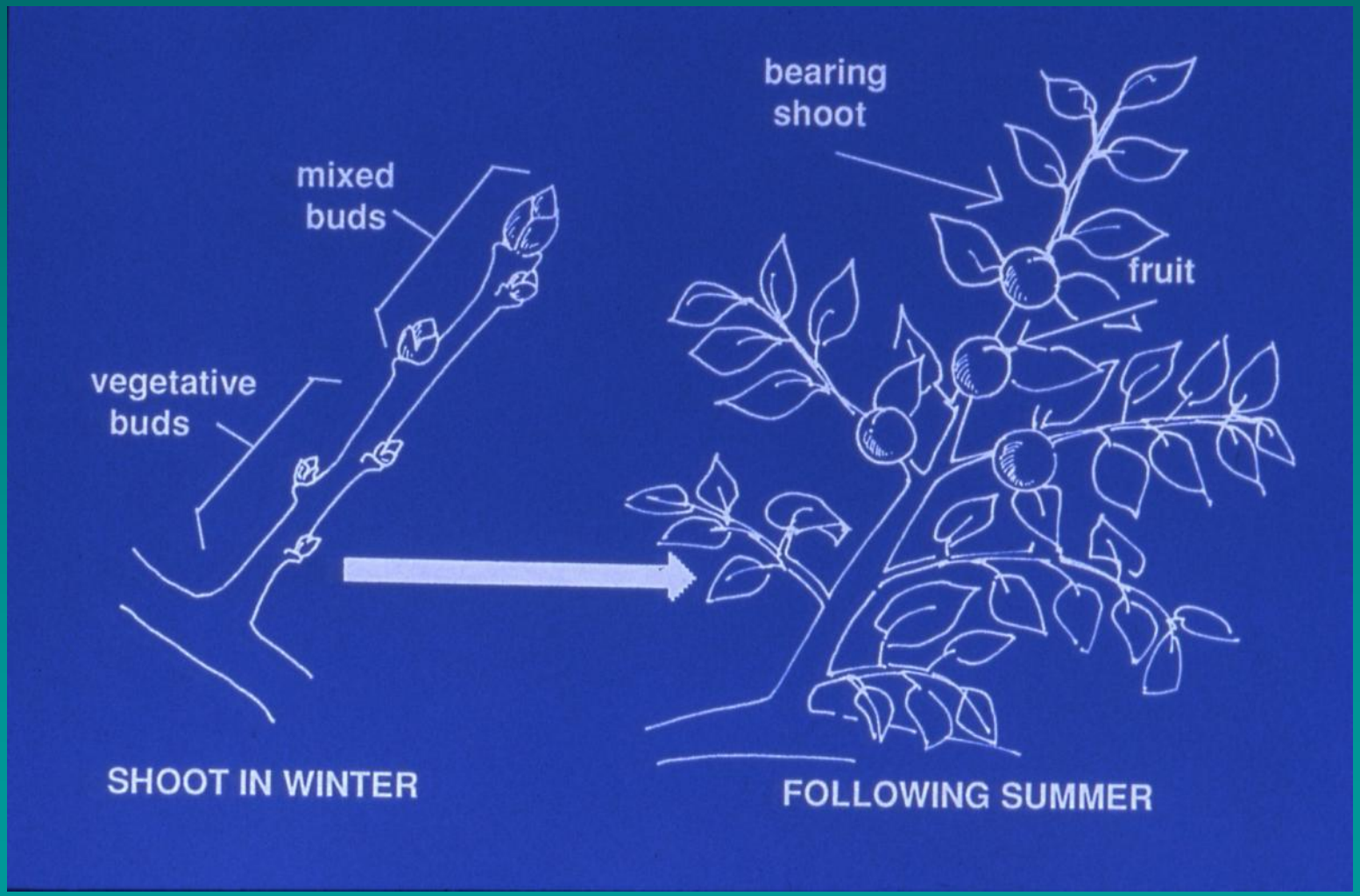
  Pruning different species

  - **Persimmon**
  - Walnut
  - Pecan

Persimmon

- Bears laterally on current season's growth
- Terminal & first few lateral buds on 1-year-old branches are mixed
  - »Both male & female flowers

Persimmon Bearing Habit

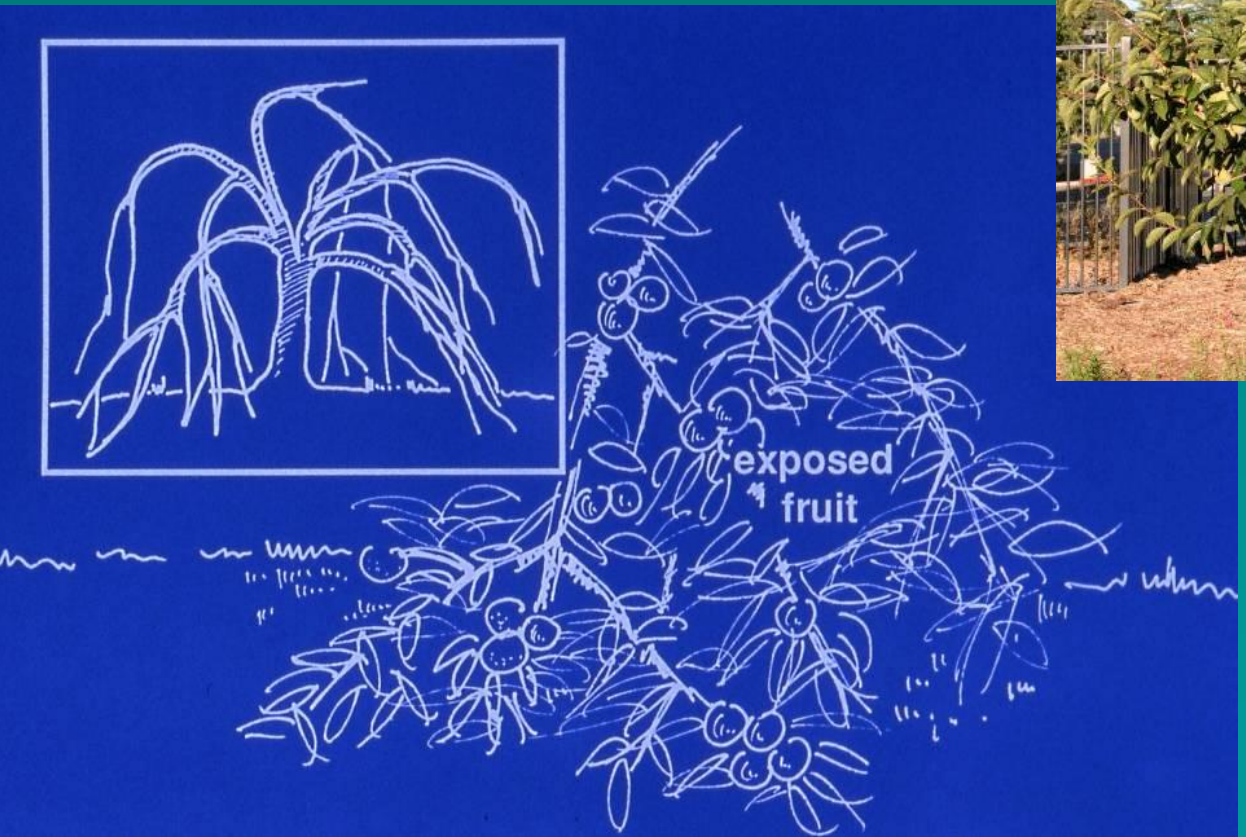


Persimmon Fruitful Shoots at Tips of 1-Year-Old Branches

Training Young Persimmons

- Modified central leader
- 3 - 5 main scaffolds
  - 1 foot intervals
  - 1st & 2nd year can pinch shoots to promote branching.
  - Head branch ends you want to keep growing into scaffolds.

Unheaded Branches on Young Trees – Lost Scaffold Branches, Sunburn



Pruning Mature Persimmons

- Dormant, annual pruning
- Primarily small cuts
- Thin out to invigorate and increase fruit size

Mature Tree – Mod. Central Leader

Overhanging limbs shade lower branches

Persimmon

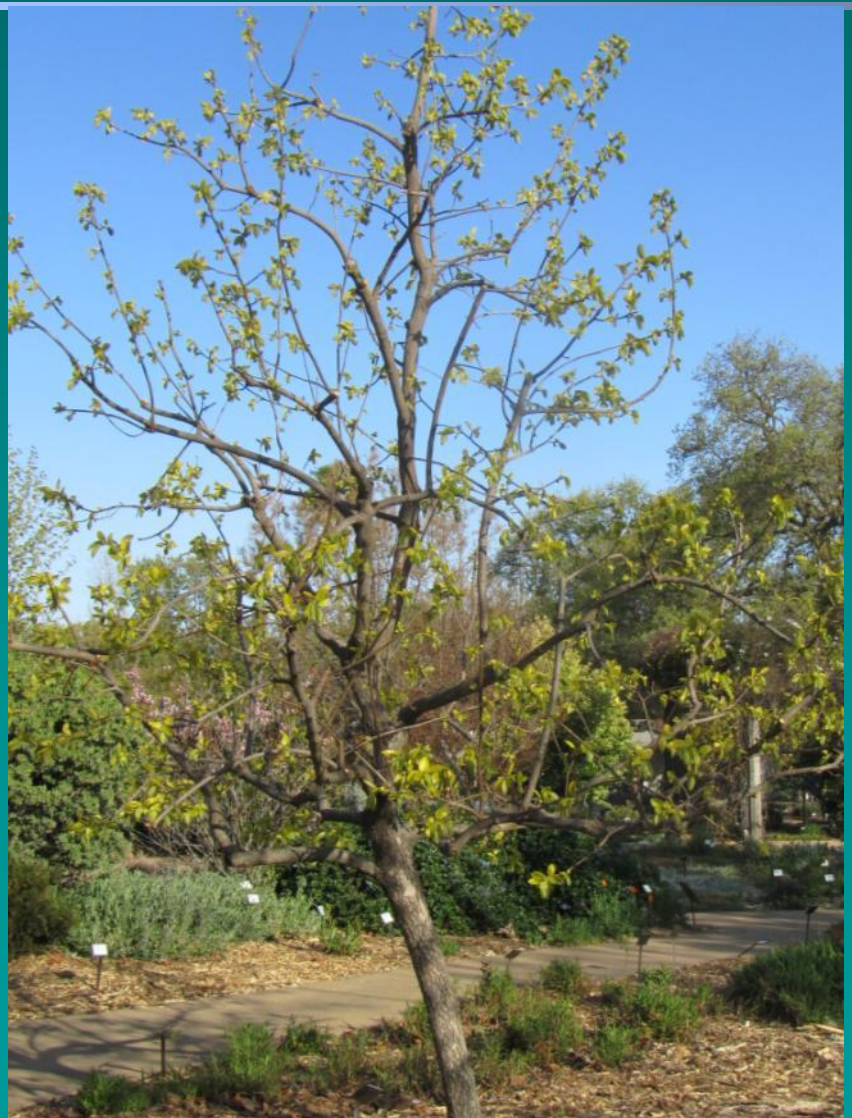
Early spring pruning

Before

After

Persimmon

FOHC



Branches freely 2nd growing season. Clean off lower wood, select primaries for modified central leader and head back.

3rd Dormant Season, head branches that you need to keep growing.

4^{th} – 6^{th} years thin out, make heading cuts to promote vegetative growth.

Unheaded → fruiting
Heading → promotes growth

Removing old wood and cutting to new growth invigorates the tree.

Maintain the modified central leader.

Thin out large arching limbs to reduce the hazard of breakage.

Pecan

Central Leader

Pecan
Central Leader

Pecan branches are weakly attached and split out easily.

When training new trees, run a hand down the trunk to pop off the necked & secondary buds

Pecan
Central Leader

Upright, narrow angled limbs are likely to split out later.

Remove them out to maintain the dominance of the leader.

Pecan
Central Leader

Shorten long branches.

Pecan
Central Leader

Upper branches were allowed to get out of control.

Fig

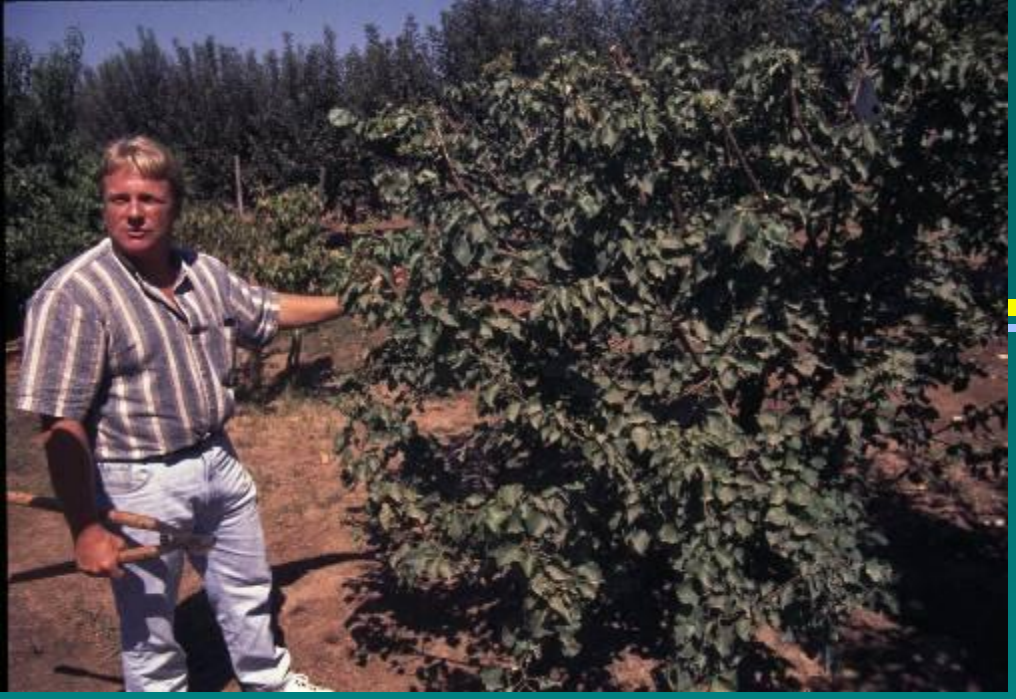
Remove low branches, thin above

Great for playing on branches, but fruit are high

Large fig, not manicured but maintained with space to walk beneath it.

Specific Fruit & Nut Tree Training Methods

- Open center
- Central leader
- Modified central leader
- Perpendicular “V”
- **Fruit bush**
- Espalier



Fruit Bushes Kept at Desired Height

Fruit Bushes
Pruning – Years 1 & 2

- At planting, head trees to 18-24 in.
- Mid-spring – cut back new growth by half
- Mid-summer – cut subsequent growth back by half
- Thinning cuts for sunlight penetration
- May need to prune 1-2 more times

Cutting New Shoots in Half

Mid-Summer

Fruit Bushes
Pruning Mature Trees

- Cut back new growth above selected tree height 2-3 times during growing season
- Thinning cuts for sunlight penetration

Mature Fruit Bush

Maintaining Tree Height

Before

After

Cherry,
Pome Fruits
Ideal for Fruit
Bush

Apricot, Plum/Pluot Fruit Bushes

Vigorous Growth – Extra Work

Apricot, Plum/Pluot Fruit Bushes

Vigorous Growth

Before

After

Fruit Bushes

- Advantages
  - Tree maintenance without ladder
  - Trees for small spaces
  - Sequential ripening
- Disadvantages
  - Less fruit
  - No shade
  - Timing of pruning critical

Key Summer Pruning Missed

Specific Fruit & Nut Tree Training Methods

- Open center
- Central leader
- Modified central leader
- Perpendicular “V”
- Fruit bush
- **Espalier**

Espalier

Angle Shoots Upward Initially

Espalier Pruning

Growing Season

Dormant Pruning

Before

After

Espalier

Menorah Shape

Other Training Methods

Pomegranate

Naturally a Large Bush

High-Density
Washington

Apples

Pears

High-Density Apples
Washington

Feathered; not headed at planting

High-Density
Washington Pears

Stub cut

Bench cut

High-Density Cherries

High-Density Cherries
Sacto. County

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Methods of Reducing Height of Large Trees

1. Cut to desired height in thirds over 3 years
   - Thin upright shoots in summer to provide light for lower fruiting wood

Pruning Overgrown Apple

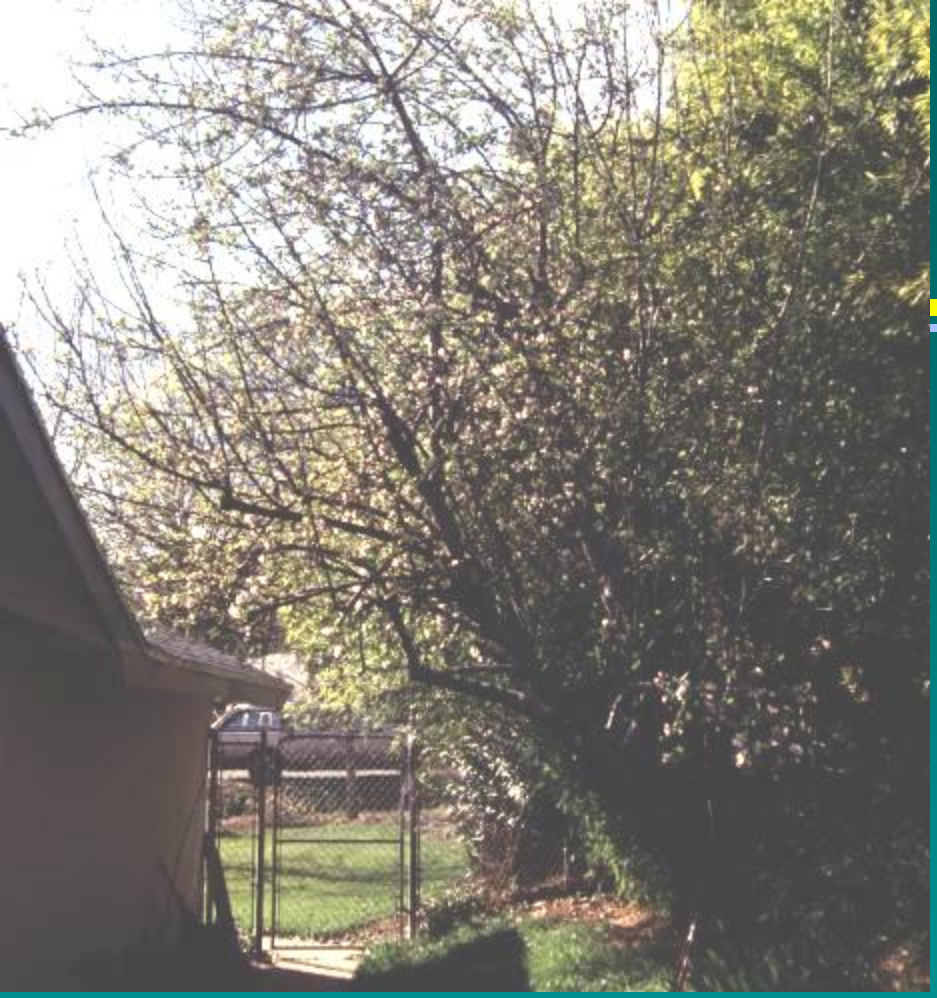
What else can be done?

Sunburn from First Topping

Methods of Reducing Height of Large Trees

1. Cut to desired height in thirds over 3 years
   - Thin upright shoots in summer to provide light for lower fruiting wood
2. Bring down height in one year
   - Saw off limbs well below desired height
   - Leave one “nurse” limb to feed roots
   - Thin new shoots, train tree as desired
   - Paint exposed limbs white

Pruning Overgrown Apple – One Year



Regrowth Weeks Later

Regrowth That Summer

Pruning Overgrown Apple – One Year

1999

- Make 2nd cut below 1st cut
  - Just above lateral branch
  - Late spring, after rains

Severe Topping Won't Always Work - Shading

Grafting Older Branches

Older Pear Grafts

Wound closing

Olives

Too Tall to Harvest

Olives
Height Reduction

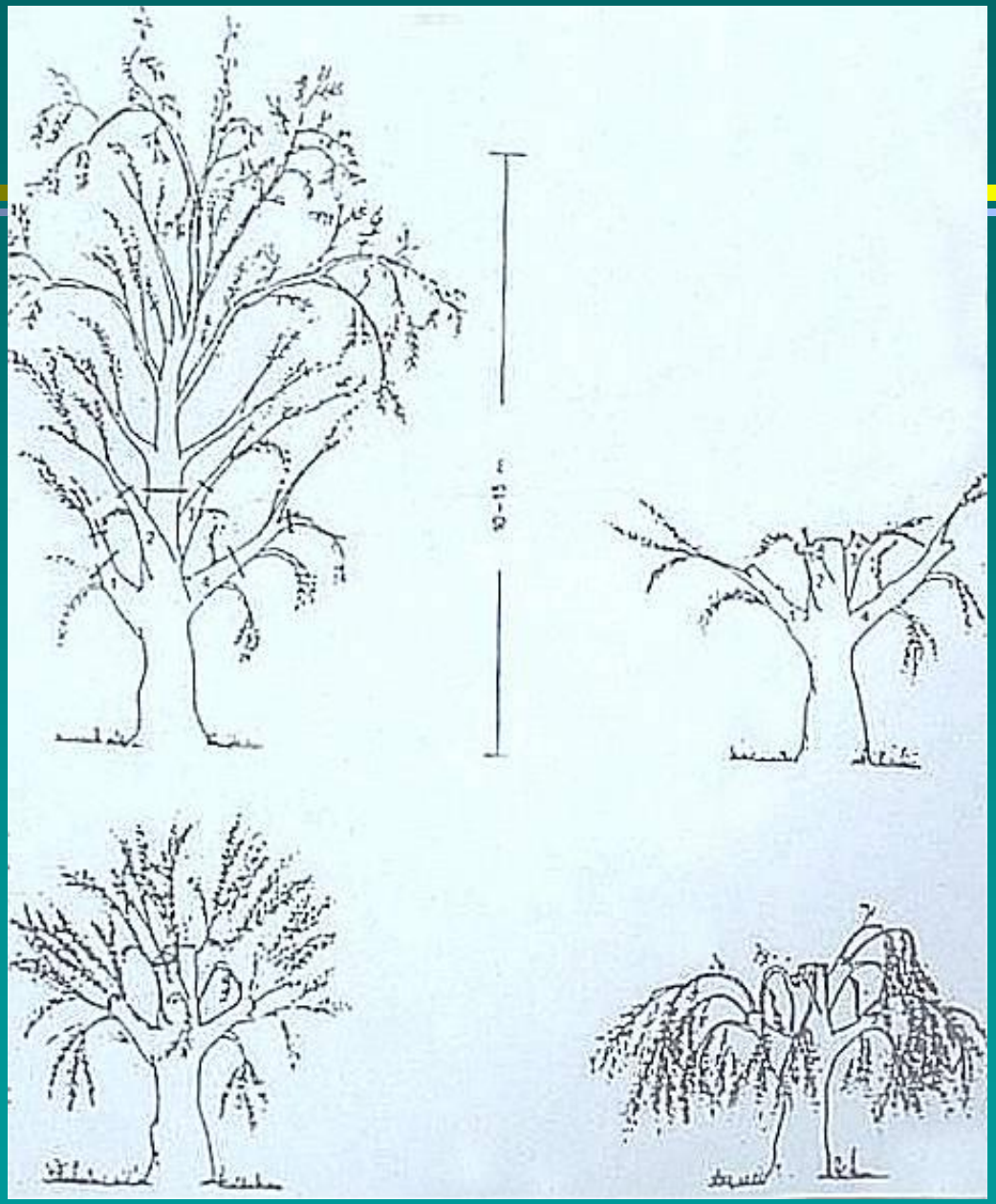
Olive trees respond well to renewal pruning.

These were cut back to 6 feet.

Olives
Height Reduction

These trees were topped too high.

Regrowth will put trees back where they started.



Expected response to renewal pruning.

Topping low at about 3 feet.

Madrid Province – old trees

Undercut to remove
old shaded wood
Inside Shading

Olives

Topping & Hedging

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Citrus Types

- Standard – to 20 or more feet
- Dwarf – to 6-10 ft.
- Good variety selection in dwarf

Citrus Pruning

- Little required – control size, shape, & suckers
- Timing – early spring after frost is best
- Usually thinning cuts
- Thin out strong upright shoots
- Keep “skirts” pruned up off ground
- Older trees respond well to shearing or rejuvenative pruning
- Whitewash exposed limbs to prevent sunburn

2-Year-Old trees: Little Pruning

Branches floppy when young. Those bending down help develop mounding canopy common on older trees.

Branches may shoot out at odd angles. Keep them; they'll bend over too

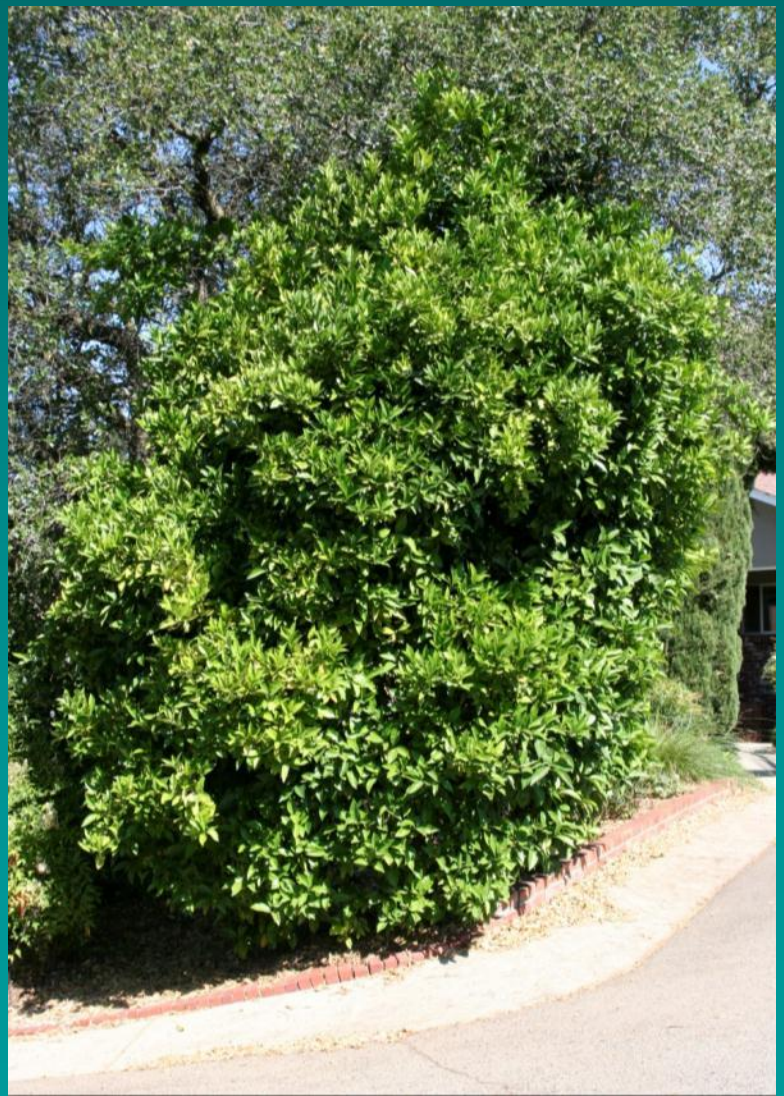
Fruit weight will tame them

Not much needed once trees are mature

Prune mainly for size control and ease of picking

Citrus

Pruning for Size Control and Shape



Watch for Rootstock Suckers

“Skirting” Trees

Branches pruned off the ground

- –Reduces fruit rot
- –Makes weed control easier

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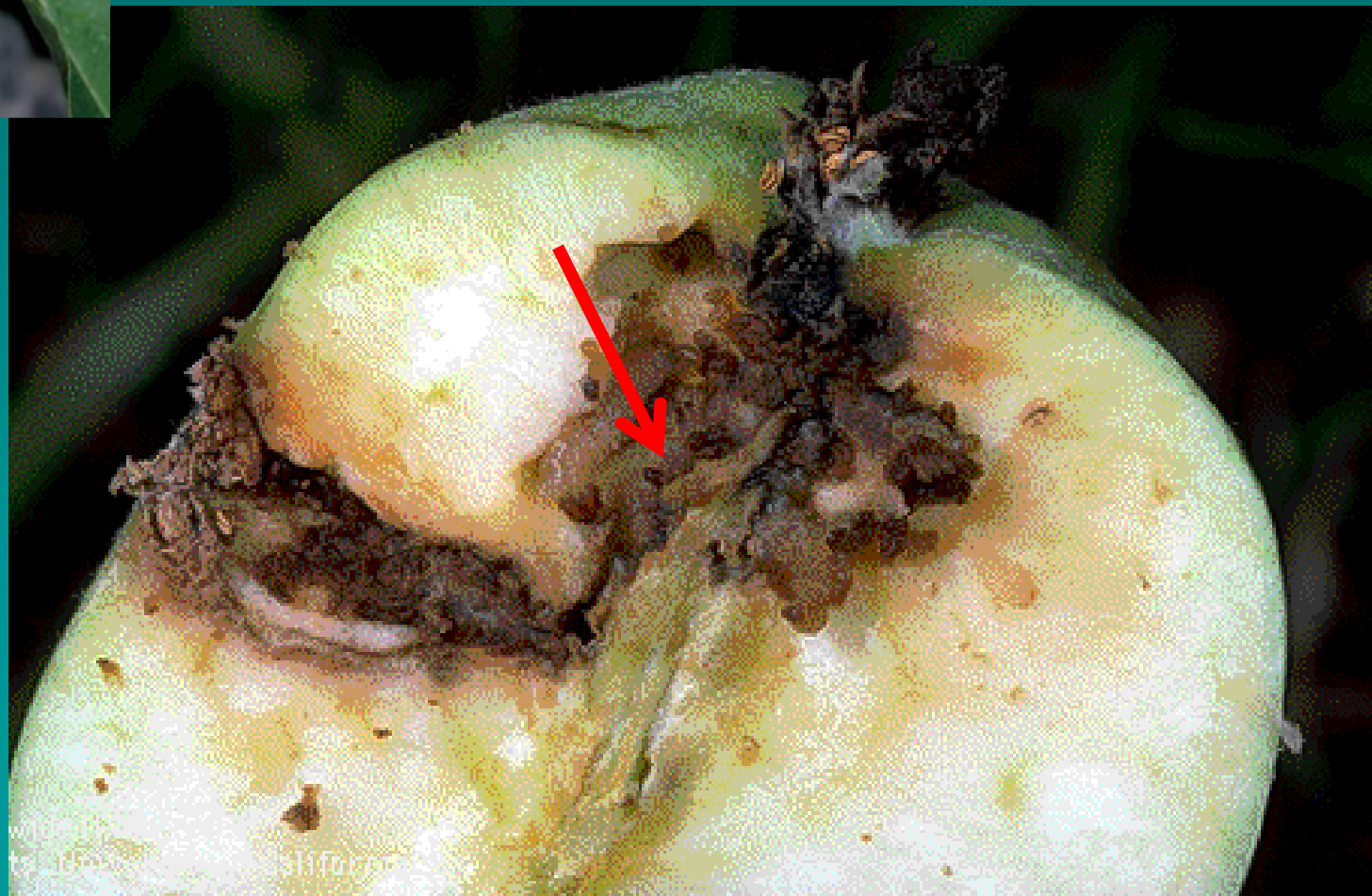
Codling Moth



Eggs and newly hatched larva

Pupating larvae

Codling Moth
Characteristics

- Pest of apple, pear, quince, walnut
- Overwinter as larva in cocoon
- Mating begins during or just after flowering (temp. dependent)
- 3 generations per year
- Extremely difficult to control

Codling Moth
Control Methods

- Take what you get, cut damage out
- Remove/destroy infested fruit early
- Bag individual fruits
- Mass trapping of males
- Organic products: Horticultural oil, CM granulosis virus (Cyd-X), spinosad
- Chemical: Sevin (kills beneficials!)
- Good coverage is essential

Pheromone Trap

SWD Damage (Maggots)

Cherry

Spotted Wing Drosophila

Mostly cherries, also blue & raspberries

male

female

- Native to Asia
- Found in Calif. in 2009
- Now endemic
- Infest mature and rotting fruit
- Overwinter as adults
- Active throughout the year

Fruit Flies

- House fly size
- Usually colorful wings
- Economically important

Vinegar Flies

- Much smaller (gnats)
- Rarely colorful wings
- Seldom economically important

Unique Ovipositor

D. simulans/ melanogaster

D. suzukii

Photos by Martin Hauser, CDFA

Monitoring

- 1-qt. bucket-style trap baited with:
  - 1 inch (4 oz.) of apple cider vinegar + 1 tbsp detergent
- Replace solution weekly
- Place trap 3-5 ft above ground

Monitoring

1-qt. bucket container

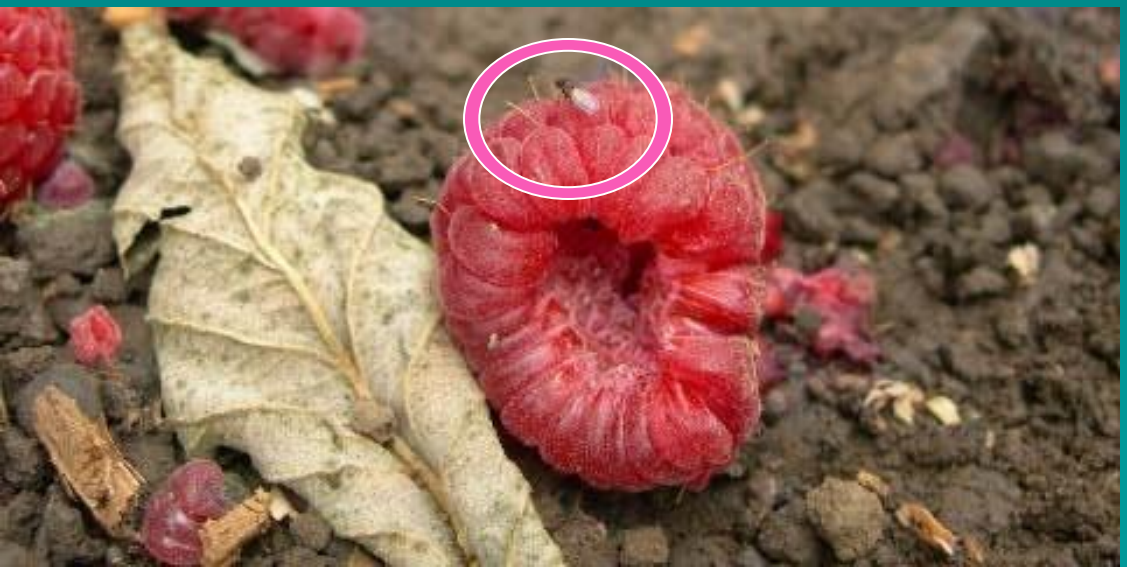
Rescue Fly Trap

Monitoring

- Monitor twice weekly starting with first color change of fruit
- Count both males & females (sex ratio in some orchards favors females)
- Use hand lens, scope, or OptiVISOR to ID females

Cultural Controls

- Sanitation
  - Remove infested and overripe fruit



Photos by Mark Bolda, UCCE

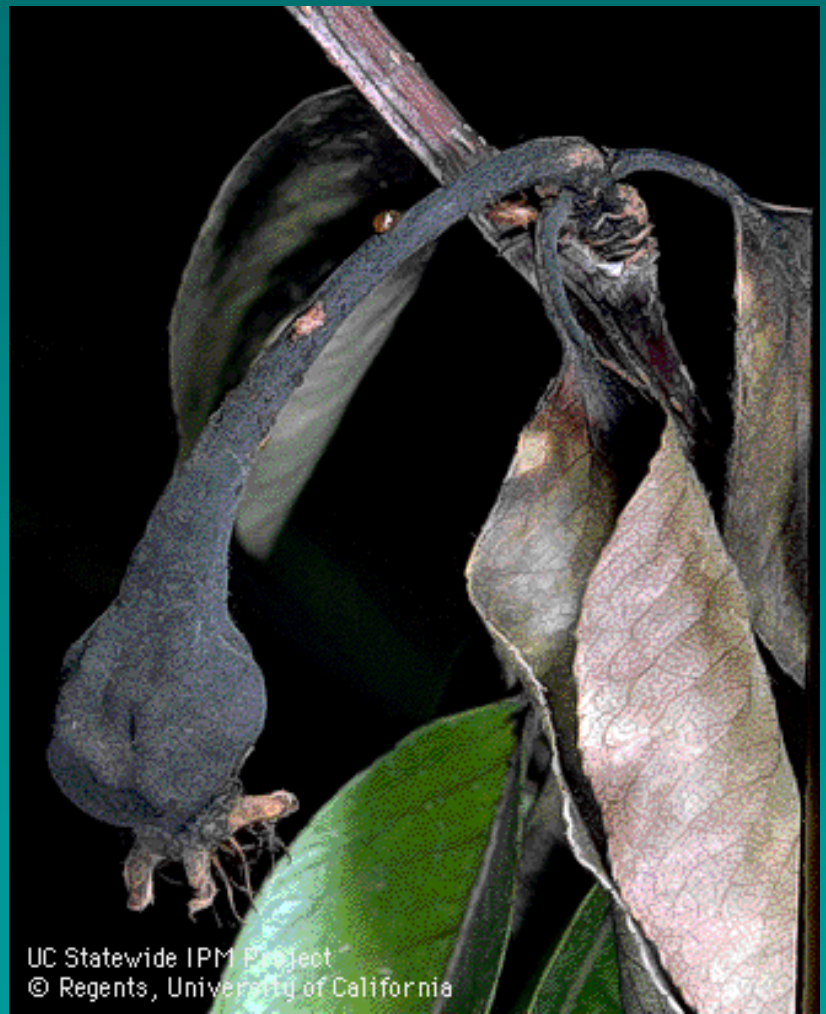
Exclusion

Fair Oaks Horticulture Center

Insecticides

- Gardeners have only Malathion and spinosad
- Begin spraying at fruit color change (straw/pink in cherries)
  - »No effect on green fruit
  - »Before fruit softening

Fire Blight


UC Statewide IPM Project
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Shoot dieback

Bark/ cambium damage

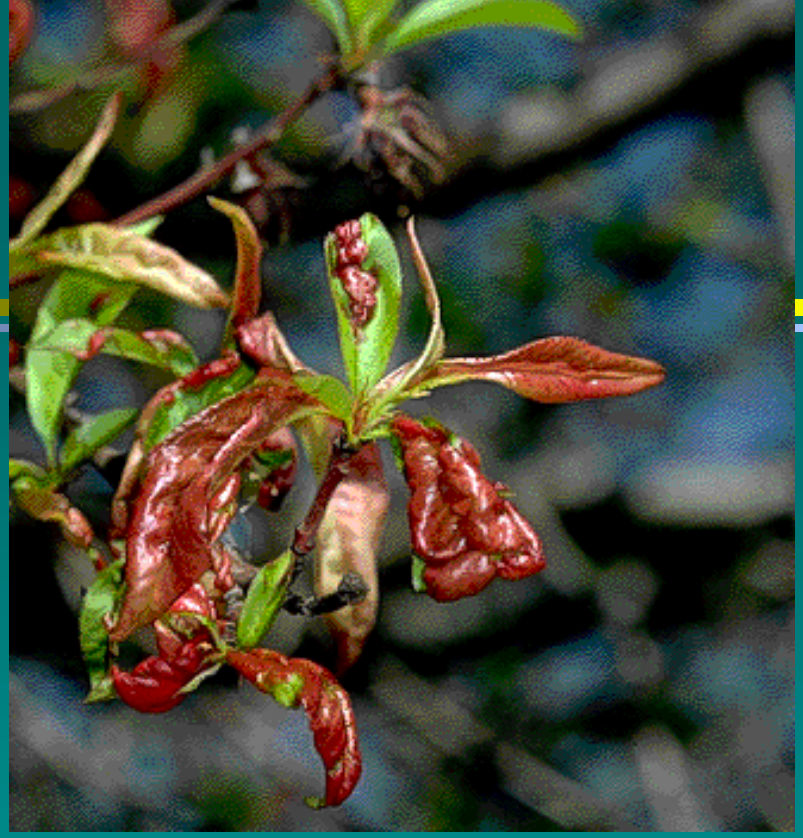
Fire Blight
Characteristics

- Bacteria – enters through flowers under warm, moist conditions
- Affects apple, pear (esp. Bartlett), Asian pear, flowering pear, quince, loquat, pyracantha, hawthorne

Fire Blight
Control Methods

- Cut shoot or branch 12 in. below infection zone
  - »Sterilize shears between cuts (20% solution of bleach)
- Spray copper product twice during bloom

Peach Leaf Curl



Shot Hole Disease and Peach Leaf Curl

- Shot hole affects peaches, nectarines, apricots (not plums!)
- Peach leaf curl affects peaches, nectarines
- Fungal diseases spread by rain, wind
- Spores overwinter in buds and twigs

Control of Shot Hole Disease and Peach Leaf Curl

- Lime sulfur, Microcop no longer available
- Copper sprays (Only Liqui-Cop and copper soap are now available)
  1. Early Dec.
  2. In Feb. as flower buds begin to swell
- Cover trees

2012 Peach Leaf Curl Trial

Treatments and Timings

Product	Rate/Gal.	Timing(s)
Lime sulfur - Microcop	1 cup 2 1/3 Tbsp.	Dec. 4 Feb. 11
Copper soap	2 fl. oz. (+ oil)	Dec. 4, Feb. 11
Liquicop	1 fl. oz. (+ oil)	Dec. 4, Feb. 11
Agribon (fabric)	AG-30, doubled	Before rains
Agribon + Liquicop	Same as above	Dec. 4, Feb. 11
Maxicrop (kelp extract)	1.7 oz.	Feb. 20 Mar. 2, 8, 12, 15, 26, 28

Individual Branches Treated

Sprayed individual branches

Agribon on branch at home

Untreated

Lime sulfur – Microcop

2012 Peach Leaf Curl Trial

Conclusions

- Lime sulfur (late fall) and Microcop (late winter) was very effective in reducing severity
- Agribon + Liquicop was at least as effective as lime sulfur / Microcop
- Copper soap, Liquicop, and Agribon were somewhat less effective than lime sulfur/ Microcop, but still provided 60-80% control

Questions?